ERCB Energy Resources Conservation Board

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Allowables Handbook—Guidelines for the Calculation of Monthly Production Allowables in Alberta

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<original signed by>

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Chairman

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1 Introduction

This directive explains the Energy Resources Conservation Board's (ERCB's) procedures for determining monthly allowables for a production entity (well or block). Allowables or maximum rate limitations (MRLs) are rate controls applied primarily to oil entities in accordance with a Board order. MRLs are assigned to new oil pools when conservation is or could potentially be an issue. MRLs help minimize depletion impacts on oil pools and ensure enhanced oil recovery (EOR) is addressed. MRLs also serve to maintain intrapool equity.

For gas wells, allowables are applied primarily for equity reasons in the administration of off-target penalties (see Section 7)

Examples are presented to illustrate overall concepts and procedures, and a glossary is included for reference. All figures cited in the directive appear at the end.

For further clarification on any topic presented in this directive, contact the ERCB Customer Contact Centre at 1-855-297-8311 (toll free).

1.1 What's New in This Edition

Changes in this edition are as follows:

- The deletion of Figure 6: Appendix to Block Approval (ST5) from the previous edition
- Alignment with current editions of *Directive 019: Compliance Assurance* and *Directive 065: Resources Applications for Oil and Gas Reservoirs*
- Updates to ERCB organization and group names
- Updates to ERCB Form O-38

2 Base Maximum Rate Limitation

The base MRL is the maximum rate of production for a production entity before reduction by any applicable gas-oil ratio or off-target penalties (see Section 3). The standard base MRL

assigned to a single-well pool is the greater of the reserve-based preliminary rate limitation (PRL) or the basic well rate (BWR) (see Figure 1).

- **BWR**—Calculated using the average well depth of all the wells in the pool using the true vertical depth (TVD).
- **PRL**—A pool's PRL is expressed in cubic metres per day (m^3/d) and calculated as the product of a pool's recoverable oil reserves (in units of thousand [10^3] m^3) and the constant 0.296. Continuous production at the PRL rate would deplete a pool's oil reserves in 9.25 years.

For multiwell pools, a well's base MRL is the greater of the BWR or the pool PRL divided by the number of nonabandoned oil wells in the pool.

Base MRL Calculation

Number of nonabandoned oil wells in the pool = 2

BWR = 10.0 m^3/d/well

Recoverable reserves (RiN) = 98.0 $10^3 m^3$

Pool MRL = 98.0 x 0.296

= 29.0 m^3/d

Well base MRL = the greater of the BWR or $\frac{\text{pool MRL}}{\text{number of nonabandoned oil wells}}$

= the greater of 10.0 m^3/d or $\frac{(29.0\ m^3/d)}{2}$

= 14.5 m^3/d

2.1 Nonconfidential Pools—MRL Order

The ERCB issues a monthly MRL order that lists the MRLs for all active nonconfidential oil pools and indicates whether a pool is subject to good production practice (GPP) or under MRL administration.

MRL orders contain two appendices:

- Appendix I—lists base MRL data on all nonconfidential pools (see Figure 2).
- Appendix II (Special Provisions)—provides details on any applicable special requirements prescribed in Column 7 of Appendix I. Operators producing from pools subject to special provisions must determine whether these provisions apply to the specific production entity they operate.

GPP pools are not restricted by a base MRL or gas-oil ratio (GOR) penalties, but may be subject to special conditions prescribed in Appendix II of the MRL order. Operators producing under GPP are expected to produce the wells in accordance with good engineering practices to optimize oil recovery.

MRL orders are posted on the ERCB website several days before the month it applies to. It is important for operators to refer to the MRL order on a monthly basis to ensure that all relevant data for calculating a given monthly allowable are taken into account. For a description of what each column of the appendix contains, see Figure 3.

Monthly Base MRL Calculation—Nonconfidential

Calculation of the monthly base MRL (i.e., unpenalized MRL, or the MRL before any reduction due to penalties [see Section 3]) for a well within a defined pool is the product of the MRL in column 5 of Appendix I of the MRL order and the number of days in the month.

For example, to calculate the base MRL for a well in the Albright Nikanassin B Pool in Figure 2:

Base MRL from Column 5	= 9.9 m^3/d
Number of days in the month	= 30
Base MRL	= Daily base MRL x number of days in the month
	= 9.9 m^3/d x 30 d = 297.0 m^3 for the month

This monthly base MRL may be subject to reduction by any applicable penalties, as described in Section 3.

2.2 Confidential Pools—ERCB Form O-38

Allowables for wells producing from confidential pools are not listed in the MRL order but are listed on ERCB Form O-38: Application for a New Well Base MRL (see Figure 4).

For wells that discover a new pool or are drilled outside existing pool order boundaries, operators must complete Form O-38 and submit it to the GESE Branch by e-mail to O38.Applications@ercb.ca within 30 days of initial production. If applicable, the ERCB will assign a base MRL and a base GOR.

Monthly Base MRL Calculation—Confidential well

Calculation of the base MRL for a single well producing from a confidential pool is the product of the base MRL as indicated on Form O-38 and the number of days in the month.

For example, to calculate the base MRL for a well from Form O-38:

MRL from Form O-38	= 18.0 m^3/d
Number of days in the month	= 31
Base MRL	= Daily base MRL x number of days in the month
	= 18.0 m^3/d x 31 d
	= 558.0 m^3 for the month

This monthly base MRL may be subject to reduction by any applicable penalties (see Section 3).

Interim MRL

For undefined wells for which an O-38 has not been approved and an MRL has not been assigned, the ERCB will assume an interim MRL of 8.0 m^3/d and a base GOR of 70 m^3/m^3 following the new oil well production period (NOWPP) (see Section 6). Operators with wells that overproduce under an interim MRL and fail to respond to an overproduction notice will be subject to enforcement in accordance with Section 10.280(3) of the *Oil and Gas*

Conservation Regulations (*OGCR*) (see Section 5.3). An interim MRL will be replaced by the official MRL once an O-38 is submitted and processed.

2.3 Horizontal Well Modifier

The horizontal well modifier (HWM) was designed to encourage, where appropriate, the drilling of horizontal wells rather than multiple vertical wells. When multiplied by the well base MRL, the HWM increases the allowable in relation to the horizontal length of the well.

Rules governing allowables for horizontal wells are as follows:

- The operator must request ERCB approval of an HWM in writing, usually as part of the O-38 submission.
- The base MRL is equal to the product of the HWM and the base MRL that would be assigned to a vertical well, where

  HWM = square root of (1 + L/100), truncated to one decimal

  L = length of the well's horizontal section in metres, calculated as the difference in log depth from the pay top of the productive zone to the well's total depth (TD) or plugback depth
- During NOWPP, the base MRL is the greater of 20.0 m^3/d or the product of the well base MRL and the HWM, subject to all other conditions of the NOWPP.
- In pools subject to a special MRL, the base MRL is equal to the product of the HWM and the special MRL.
- HWMs are specified in clause 9a of Appendix II to the MRL order for nonconfidential pools, and on Form O-38 for confidential pools.

Monthly Base MRL Calculation for a Horizontal Well

For example, using the allowable record for a horizontal well in Figure 5, a base MRL calculation for a well assigned an HWM, both during NOWPP and after NOWPP, is as follows:

- Base MRL of a horizontal well during NOWPP:

NOWPP MRL	= 20.0 m^3/d
HWM	= 2.0
Number of days in the month	= 31
Base MRL	= NOWPP MRL x HWM x days in the month
	= 20.0 m^3/d x 2.0 x 31 d
	= 1240.0 m^3 for the month

- Base MRL of a horizontal well on MRL (after NOWPP):

MRL	= 8.0 m^3/d
HWM	= 2.0
Number of days in the month	= 30
Base MRL	= Daily MRL x HWM x days in the month
	= 8.0 m^3/d x 2.0 x 30 d
	= 480.0 m^3 for the month

2.4 Other MRL Considerations

1) Applications for a new well MRL (Form O-38) should be submitted within the first month of production. In the case of horizontal wells, Form O-38 must be submitted unless the entire length of the horizontal section is within the existing ERCB pool order. If only an enhanced recovery mechanism is listed for a pool in the MRL order, Form O-38 is required to set a primary allowable for a new primary well being drilled into the pool.

2) The Board may assign GPP status for new pools through the O-38 approval process if conservation is clearly not an issue. However, operators must not assume GPP status except if it is specifically authorized in the MRL order. If GPP is not approved through the O-38 process, application for GPP can be made in accordance with *Directive 065: Resources Applications for Oil and Gas Reservoirs*.

3) For a new well to receive the MRL/GPP status prescribed for an existing EOR scheme, the well must be within the scheme's existing approval area as defined for the pool by the ERCB's EOR approval. To add a new well to an existing EOR approval, an application must be made to expand the scheme's approval boundaries in accordance with *Directive 065*.

4) If a well's fluid classification changes from gas to oil and the well is subject to an MRL, the allowable will be calculated from the effective date of the status change.

5) GPP will normally be granted to wells within the approval area of a new EOR scheme provided that injection is planned to begin within three months of the approval date.

3 Penalties

3.1 Gas-Oil Ratio Penalty

GOR penalties are applied to production entities when the producing GOR exceeds the base GOR. They are imposed to limit production primarily to optimize oil and gas conservation. The base GOR is prescribed in column 6 of Appendix I to the MRL order for nonconfidential pools and on Form O-38 for confidential pools.

Base GOR Calculation

The base GOR is determined from the formula below, as set out in Schedule 6 of the *OGCR*:

$$\text{Base GOR } (m^3/m^3) = R_{si} + 1.67\left(\frac{P_b + 101.325}{T + 273.15}\right)$$

where R_{si} = initial solution GOR
P_b = bubble point pressure
T = reservoir temperature

The reservoir parameters used in the formula are determined from pressure volume temperature (PVT) analysis, when available, or from Standings Correlation.

GOR Penalty Factor Calculation

The GOR penalty factor is calculated as the base GOR divided by the producing GOR. The GOR penalty factor is equal to 1.0 when the produced GOR is less than or equal to the base GOR. This penalty factor is then multiplied by the base MRL to determine the adjusted MRL. (Note that the ERCB reports gas production in units of 10^3 m^3 and oil in units of m^3.)

For example, using the production data below, calculate the GOR penalty factor as follows:

Base MRL (given)	= 10 m^3/d
Monthly base MRL	= 300 m^3, based on a 30-day month
Base GOR	= 130 m^3/m^3
Monthly oil production	= 290 m^3
Monthly gas production	= 53.7 10^3 m^3

$$\text{Produced GOR} = \frac{\text{Gas production}}{\text{Oil production}} = \frac{53.7\ 10^3\ m^3}{290.0\ m^3} = 185\ m^3/m^3$$

$$\text{GOR penalty factor} = \frac{\text{Base GOR}}{\text{Produced GOR}} = \frac{130\ m^3/m^3}{185\ m^3/m^3} = 0.70$$

Adjusted MRL = monthly base MRL x GOR penalty factor
= 300.0 m^3/ month x 0.70
= 210.0 m^3 for the month

3.1.1 Applying the GOR Penalty Factor to the Base MRL

The adjusted MRL for a given month is calculated using the GOR penalty factor from the **third preceding month**. This enables operators to forecast future months' allowables using available production data. For example, when calculating the penalized MRL for April, use the GOR penalty factor from the January production data. If there is no production in the third preceding month (January), use the second preceding month (February). If there is no production in the second preceding month (February), use the first preceding month (March). Use the current-month's GOR penalty factor against that month and the following three months if there has been no production over the previous three months or if the production entity is subject to any of the following changes:

- a change in the base GOR,
- the commencement of gas conservation for pools subject to net GOR penalty relief,
- the first month after NOWPP,
- the first month after production test,
- the formation of a new block, or
- a GPP or net GOR penalty relief that has been rescinded or expired.

If an entity has been shut-in to retire overproduction and the cumulative overproduction status has not been reduced to zero by the end of the third consecutive shut-in production month, then from the fourth consecutive shut-in month and thereafter retirement will be calculated at the unpenalized MRL (i.e., no GOR penalty).

3.1.2 Net GOR Penalty Relief

Where gas is conserved and upon successful application, the ERCB may grant relief from GOR penalties based on net gas production. Application for net GOR penalty relief is made under Section 10.060 of the *OGCR* in accordance with *Directive 065*.

If net GOR penalty relief is granted, the net produced GOR is calculated on the volume of gas flared and vented, not on the month's total gas production. If the net produced GOR is less than the base GOR, the net GOR penalty factor is equal to 1.0.

$$\text{Net produced GOR} = \frac{\text{Gas flared + vented}}{\text{Oil production}}$$

$$\text{Net GOR penalty factor} = \frac{\text{Base GOR}}{\text{Net produced GOR}}$$

Multiwell facilities must prorate the battery flared/vented volume to individual wells based on their prorated share of total battery production as reported through the volumetric submission to the Petroleum Registry of Alberta (PRA).

$$\text{Well's gas flared/vented} = \frac{\text{Well's gas production x (total battery flared + vented)}}{\text{Total battery gas production (includes other receipts)}}$$

3.2 Off-Target Penalty

When a well is completed outside its prescribed target area, an off-target penalty factor may be imposed against the base MRL. The following conditions apply to off-target penalties:

1) An operator is responsible for the surveillance of any well that may be drilled off-target towards its wells. An off-target penalty will be assessed upon successful application from a competitive operator in accordance with Section 4.060 of the *OGCR*.

2) If a well is spudded on or after April 1, 1994, and is the first well in a pool, off-target penalties are not applied. For oil wells, the "first well" is the well in a pool with the earliest spud date and which was placed on production within six months of its spud date (Sections 4.060[5] and [6] of the *OGCR*).

3) The off-target penalty factor (as described in Schedule 14 of the *OGCR*) is always applied to the base MRL first, followed by any applicable GOR penalties.

4) Off-target penalties may be applied during NOWPP.

5) The off-target penalty factor normally does not reduce the base MRL below 5.0 m^3/d.

6) For GPP pools, the ERCB determines the rate against which to apply the off-target penalty based on the reported capability of the offending and other wells in the pool.

7) Off-target penalties in effect for pools on GPP status are listed in clause 5 and for MRL pools in clause 8 of Appendix II of the MRL order or in an ERCB letter of disposition.

8) Upon successful application for removal of the off-target penalty of a production entity in an MRL pool, in accordance with *Directive 065*, the off-target penalty will no longer be applied and the entity will continue under normal MRL administration.

9) Upon successful application for removal of the off-target penalty of an entity in a GPP pool, any outstanding cumulative overproduction must be retired at the good production practice retirement rate (GRR) (see Section 5.2).

MRL Calculation for an off-target well

For example, using the data below, calculate the adjusted MRL for an off-target well with the applicable GOR penalty factor as follows:

Daily base MRL	= 10.0 m^3/d
Off-target penalty factor	= 0.25
GOR penalty factor	= 0.60
Number of days in the month	= 31

Monthly base MRL	= Daily base MRL x number of days in the month
	= 10.0 m^3/d x 31 d
	= 310.0 m^3
Off-target adjusted MRL	= the greater of the monthly base MRL x off-target penalty factor
	or 5.0 m^3/d x number of days in the month
	= the greater of 310.0 m^3/m x 0.25 = 77.5 m^3/m
	or 5.0 m^3/d x 31 d = 155.0 m^3/m
Adjusted MRL	= off-target adjusted MRL x GOR penalty factor
	= 155.0 m^3/m x 0.60
	= 93.0 m^3 for the month

4 Blocks

Blocks are producing entities containing wells with contiguous drilling spacing units (DSUs) of common ownership. Blocks require demonstration of improved oil recovery under primary depletion. They are administered and produced as single production entities for the purpose of allowables. Operators must apply for block status in accordance with Part 5 of the *OGCR*.

The daily base MRL for each block is listed in clause 9 of Appendix II to the MRL order each month. To obtain the monthly base MRL for a block, the daily base MRL is multiplied by the number of days in the month and then reduced by any applicable penalties, as described in Section 3. The producing GOR for the block is calculated based on the total monthly gas production of all the wells divided by the total oil production. When a block is established, the cumulative overproduction of each well included in the block at the end of the month preceding the formation of the block is carried forward into the block.

For a change in owner or operator of a block, a transfer of approval form, as set out in Appendix D of *Directive 065*, must be submitted. If ownership in a block is no longer common, an application must be submitted to rescind or amend the block approval.

4.1 Oil Control Wells

An oil control well is defined as a well capable of producing oil that is within a block and is completed in a DSU contiguous to a DSU containing a producing well outside the block (clause 5(i) of Section 1.020(2) of the *OGCR*).

Control well status is imposed in accordance with Section 10.170(1) of the *OGCR* upon written request. In the event of a control well being off target, the off-target penalty factor is applied against the block allowable and against the control well. In blocks, the control well rate is equal to that assigned to other wells outside the block as prescribed in the MRL order.

5 Overproduction

The MRL system is administered to preserve conservation and equity within a pool and to provide a level playing field for all operators. The ERCB considers overproduction to be any production in excess of the adjusted MRL for a production entity. The ERCB recognizes that minor overproduction may occur from time to time and therefore does not assess a penalty if overproduction is less than 10 per cent of the adjusted MRL. Overproduction is the cumulative status (the sum of the previous and the current month's overproduction, including any penalty).

To discourage overproduction, the ERCB applies an overproduction penalty to any production entity if the overproduction exceeds 10 per cent of its adjusted MRL. Furthermore, to promote timely retirement of overproduction, the ERCB requires that **all cumulative overproduction exceeding 10 per cent of a production entity's adjusted MRL must be retired (reduced to zero status) by the end of the third month following the first month of overproduction.** Overproduction is retired by producing less than the adjusted MRL or shutting in the well in the month(s) following overproduction.

Note that underproduction in any month is used to offset the previous month's cumulative overproduction status. However, underproduction may not be carried forward for use in later months, except during NOWPP.

5.1 Overproduction Penalty

A 50 per cent overproduction penalty is assessed each month that the monthly overproduction exceeds 10 per cent of the adjusted MRL. This penalty is calculated as 50 per cent of the difference between the reported monthly production and 110 per cent of the adjusted MRL. All cumulative overproduction, including penalties, must be retired within three months once overproduction exceeds 10 per cent of the adjusted MRL.

Overproduction Penalty Calculation

Using the following data from the allowable record shown in Figure 6:

Monthly oil production = 292.8 m^3

Monthly adjusted MRL = 224.0 m^3

Calculate the monthly overproduction penalty as follows:

Monthly overproduction	= monthly production – adjusted MRL
	= 292.8 m^3 – 224.0 m^3
	= 68.8 m^3
110% of adjusted MRL	= adjusted MRL x 1.1
	= 224.0 m^3 x 1.1
	= 246.4 m^3
Overproduction penalty	= (Production – 110% of adjusted MRL) x 0.5
	= (292.8 m^3 – 246.4 m^3) x 0.5
	= 23.2 m^3

Using the following data from the same figure:

Prior cumulative status	= 15.5 m^3 (January 2009)
Monthly overproduction	= 68.8 m^3

The cumulative status for February 2009 is calculated as follows:

Overproduction penalty	= 23.2 m^3
Cumulative status	= Prior cumulative status + monthly overproduction + overproduction penalty
	= 15.5 m^3 + 68.8 m^3 + 23.2 m^3
	= 107.5 m^3

5.2 GPP Retirement Rate (GRR)

When a change in the pool's MRL administration has been approved, any outstanding overproduction must be retired at the new pool allowable. If GPP status is approved, retirement of any outstanding overproduction is at the GRR of the individual overproduced production entity commencing with the month GPP is approved.

GRR Calculation

The GRR is the greater of the MRL or the average operating-day rate of the production entity during the months overproduced. GOR penalties are not assessed when retiring the overproduction under the GRR.

For example, using the following data from the allowable record in Figure 6:

Base MRL	= 8.0 m^3/d
Months overproduced	= January–April
Production (January–April)	= 263.5 m^3 + 292.8 m^3 + 265.8 m^3 + 285.2 m^3
	= 1107.3 m^3
Producing hours (January–April)	= 672 + 696 + 704 + 720 = 2792 hours (as reported in the volumetric submission to the PRA)
GPP Granted	= June

The GRR would be calculated as follows:

$$GRR = \frac{\text{Production from months overproduced}}{\text{Producing hours from the months overproduced}} \times 24 \text{ hours/day (hr/d)}$$

$$= \frac{1107.3\ m^3}{2792 \text{ hours}} \times 24 \text{ hr/d}$$

$$= 9.5\ m^3/d$$

If a well is overproduced during its NOWPP, the GRR is calculated based on the month(s) the well's cumulative production exceeds the total NOWPP allowable. For example, using the data from the allowable record in Figure 7:

Total NOWPP allowable	= 2400.0 m^3
NOWPP months	= January, February, March, April
Cumulative production (January–April)	= 500 m^3 + 800 m^3 + 800 m^3 + 1500 m^3
	= 3600 m^3
Month that cumulative production exceeds the total NOWPP allowable (2400 m^3)	= April
GPP granted	= May
April production	= 1500 m^3
April hours	= 720 (as reported in the volumetric submission to the PRA)

The GRR for a well within NOWPP is calculated as follows:

$$GRR = \frac{\text{Production from month in which cumulative production exceeds NOWPP allowable}}{\text{Producing hours from the month in which cumulative production exceeds NOWPP allowable}} \times 24 \text{ hr/d}$$

$$= \frac{\text{April production}}{\text{April hours}}$$

$$= \frac{1500\ m^3}{720 \text{ hours}} \times 24 \text{ hr/d}$$

$$= 50.0\ m^3/d$$

5.3 Compliance and Enforcement

To ensure a level playing field for all operators and to promote a more timely retirement of overproduction, the ERCB requires the operator of a production entity to retire (to zero status) all cumulative overproduction exceeding 10 per cent of the adjusted MRL by the end of the third month following the first month of overproduction. Failure to retire all overproduction will result in enforcement in accordance with *Directive 019: Compliance Assurance*. Self-disclosures on retirement of oil overproduction are not accepted.

Using the data within Figure 6, the following example illustrates a noncompliant overproduced well:

Production month	Compliance status	Months overproduced	Cumulative overproduction status	Comments
January 2009	Compliance	0	15.5 m^3	Well cumulative status (15.5 m^3) is < 10% of the adjusted MRL of 248.0 m^3, or 24.8 m^3.
February 2009	Notice	1	107.5 m^3	Well cumulative overproduction status is > 10% of the adjusted MRL of 224.0 m^3 or 22.4 m^3. All overproduction must be retired (to zero status) within three months (May 31, 2009). If cumulative overproduction status is not at zero status, then well must be shut in by June 1, 2009.
May 2009	High Risk Enforcement Action (Shut-in)	4	165.4 m^3	Well cumulative status not reduced to zero status by May 31, 2009.

If the ERCB has received amended production data for any production entity for prior month(s) and processing of the amended data indicate that the production entity is in an overproduction status, the ERCB will apply enforcement action for the noncompliance for the month(s) the production entity is overproduced. If enforcement action has been issued and amended production data indicate that previously issued enforcement should be removed, the ERCB will rescind the enforcement action.

Production data amendments may be subject to review by the ERCB Production Audit Team.

5.4 Allowable Record

The ERCB maintains an allowable record for each production entity on MRL. Terms of an allowable record are described in Figure 8. This record should be used as a basis for comparison with the operator's own records. An operator is responsible for correctly maintaining allowable records for the wells it operates. Allowable records for all nonconfidential production entities are available to the public from ERCB Information Services (call 1-855-297-8311 [toll free] or e-mail infoservices@ercb.ca). Allowable records for all confidential production entities are available to the current operator (the company reporting the production data on the PRA).

5.5 Waiver of Overproduction

The ERCB may grant a waiver of overproduction in unique situations if an operator can demonstrate in writing that retiring the overproduction would compromise conservation. Direct requests for waivers of overproduction to the GESE Branch.

6 New Oil Well Production Period

NOWPP provides new oil wells with operational flexibility to gather production data on new wells subject to the following conditions:

1) NOWPP consists of the first four producing months and commences with either the first month in which there is new oil production or the on-production month reported through the well status change on the PRA, whichever occurs first.

2) Base MRL during NOWPP is the greater of 20.0 m^3/d or the reserve-based MRL.

3) NOWPP is considered as a single production period for overproduction administration, meaning that underproduction may be carried forward within NOWPP.

4) NOWPP expires one year from the on-production month.

5) GOR and overproduction penalties are not applied during NOWPP; however, any overproduction incurred during this period must be retired.

6) Off-target penalties may be applied during NOWPP.

7) The GOR of the first producing month after the expiration of NOWPP is used to determine the GOR penalty factor for that month and the following three months.

8) New wells completed within a block are not eligible for NOWPP.

9) Upon written notification to the GESE Branch, shut-in month(s) within NOWPP may be counted as producing month(s) to reduce overproduction.

10) For horizontal wells producing under NOWPP, the MRL is the product of the MRL and the HWM.

11) Upon written request to the GESE Branch, the ERCB may delay the commencement of NOWPP if an oil well is flaring for the purpose of testing, cleanup, or completion to obtain data for economic evaluation and for sizing equipment at new oil batteries. Flaring must be in the first month of production and should not exceed a total of 72 hours, in accordance with *Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting*. The well must remain shut in after the 72 hour test until the gas is tied in and conserved. These requests will only be considered after the gas is being conserved.

7 Gas Allowables

A gas well is normally permitted to produce unrestricted and in accordance with good engineering practices. However, there are three situations when the ERCB may issue a gas allowable (GA) order for the purpose of setting the maximum cumulative gas production or gas production rate for a gas well or wells in a pool:

- when the ultimate recovery of gas may be adversely affected by unrestricted production rates (Section 10.300[1] of the *OGCR*);
- when a gas well is completed outside of its prescribed target area and upon successful application from an offsetting operator to apply an off-target penalty to the well's base allowable (Section 4.070[1] or Section 5.300 of the *OGCR*);
- when the ERCB has approved a fractional section as a DSU and there is a need to apply an area-ratio production penalty or off-target penalty for equity reasons (Section 4.050[1] and [2] of the *OGCR*).

If a well is spudded on or after April 1, 1994, and is the first well in a pool, off-target penalties are not applied. For gas wells, the "first well" is the well in a pool with the earliest spud date that is completed and for which a suitable test has demonstrated that the well has the ability to produce gas at commercial rates on a sustained basis (Sections 4.060[5] and [6] of the *OGCR*).

Section 10.095 of the *OGCR* designates that the base allowable for a gas well is its maximum daily allowable (Q_{max}). The calculation of Q_{max} is explained in Section 10.300(1)(c) of the *OGCR* and Section 3.6 of *Directive 065*. Penalties are applied against the well's Q_{max} and an annual allowable is assigned based on this Q_{max} and the number of days in the allowable year or remaining in the allowable year.

The assigned allowable for an off-target gas well, fractional section DSU, or well(s) in a pool for conservation reasons is effective the date given in the disposition letter. Allowables assigned by letter are coalesced into a GA order issued each year in January and updated quarterly throughout the allowable year. The penalty factor and Q_{max} for confidential wells will be assigned by disposition letter only.

An annual pressure survey must be submitted by November 1 for an allowable to be assigned for the following allowable period (commencing January 1). Failure to submit a pressure test by November 1 will result in the assignment of the minimum allowable of 2.0 $10^3 m^3$ per day for the next allowable period.

To discourage overproduction, the ERCB applies a penalty to any gas well if the cumulative overproduction exceeds 10 per cent of a well's allowable. If a well is overproduced, the ERCB will increase the overproduction status by an amount equal to 0.5 times the overproduction in excess of 10 per cent of the allowable. The overproduction status of a well is determined after the production data for the month of December have been filed with the ERCB. The allowable calculated for the next allowable period will then be adjusted to reflect the overproduction and any overproduction penalty from the previous allowable period. The adjusted (penalized) allowable will be communicated by letter to licensees of overproduced wells after the annual GA order is issued.

If, due to changes in the *OGCR*, a gas well that was previously off target and subject to penalties is no longer off target, the licensee may apply in accordance with Section 3.6 of *Directive 065* to have the off-target penalty removed, provided that all cumulative overproduction has been retired.

The gas well licensee is required to shut in wells once the annual gas allowable has been reached. Wells that overproduce their annual assigned gas allowable will be given notice by the ERCB requiring immediate shut-in of the well. If a licensee fails to shut in the well after receiving notice from the ERCB, an enforcement action will be issued in accordance with *OGCR*, Section 10.280(3). Wells that overproduce must remain shut in until all overproduction including penalties has been retired.

Direct any questions concerning gas allowables to the ERCB Customer Contact Centre at 1-855-297-8311 (toll free).

Overproduction Penalty Calculation for a Gas Well

The overproduction penalty for the end of the accounting period is calculated as follows:

Annual allowable	=	25 000.0 $10^3 m^3$
Annual production	=	35 000.0 $10^3 m^3$
Overproduction	=	production – allowable
	=	35 000 $10^3 m^3$ – 25 000 $10^3 m^3$
	=	10 000 $10^3 m^3$

Production subject to penalty	=	overproduction – 10% of allowable (25 000 $10^3 m^3$)
	=	10000 $10^3 m^3$ – 2500 $10^3 m^3$
	=	7500 $10^3 m^3$
Penalty	=	production subject to penalty x 0.5
	=	7500 $10^3 m^3$ x 0.5
	=	3750 $10^3 m^3$
Status at next accounting period	=	overproduction + penalty
	=	10 000 $10^3 m^3$ + 3750 $10^3 m^3$
	=	13 750 $10^3 m^3$

8 Glossary

Adjusted maximum rate limitation (MRL) or allowable — The MRL of production for a production entity after penalty factors have been applied.

Base maximum rate limitation (base MRL) — The amount of production that, according to a Board order, can be taken prior to any applicable penalty factors being assessed.

Base gas-oil ratio (base GOR) — Defined in Schedule 6 of the *OGCR* using the formula

$$\text{Base GOR } (m^3/m^3) = R_{si} + 1.67\left(\frac{P_b + 101.325}{T + 273.15}\right)$$

Block — An area or part of a pool consisting of wells grouped for the purpose of obtaining a common aggregate production allowable.

Cumulative overproduction status — The sum of all previous months' overproduction plus the current month's overproduction, including any penalty.

Enhanced oil recovery (EOR) approval area — The area of a pool recognized as being operated under enhanced oil recovery.

Gas allowable — The maximum cumulative gas production that, according to a Board order, could be taken in the prescribed time period.

Gas-oil ratio (GOR) — The monthly gas production divided by the monthly oil production.

Gas-oil ratio penalty factor (GOR penalty factor) — The base GOR divided by the produced GOR.

Good production practice (GPP) — When production is not governed by a base allowable but is conducted in accordance with sound engineering principles.

Good production practice retirement rate (GRR) — The rate at which overproduction is retired once GPP is approved.

Horizontal well modifier (HWM)	A factor greater than 1.0 that is assigned to a horizontal well and applied to the base MRL.
Licensee	For gas allowable purposes, the licensee of record is responsible for the overproduction.
Net gas-oil ratio (net GOR)	The ratio of monthly volume of gas flared and/or vented divided by oil production.
Net gas-oil ratio penalty factor (net GOR penalty factor)	The base GOR divided by the net GOR.
Off-target	A well that is completed outside its prescribed target area pursuant to the *OGCR*.
Off-target penalty factor	A factor less than 1.0 that is applied against the base MRL for an off-target well.
Operator	For oil allowable purposes, the operator is considered the party reporting the production data to the PRA and is responsible for the overproduction.
Overproduction	Any production in excess of the adjusted MRL.
Preliminary rate limitation (PRL)	The initial determination of a pool's base MRL based on pool reserves.
Q_{max}	The maximum daily allowable of a gas well, determined in accordance with Section 10.300 of the *OGCR*, that is used to calculate the maximum cumulative production for a penalized gas well.
Target area	The part of a drilling spacing unit (DSU) within which a well may be completed for the purpose of producing oil or gas without reducing its allowable because of its location.

9 Data Precision

The number of decimal places to be used in calculations is as follows:

Table 1. Number of decimal places to be used in calculations

Items	Number of decimal places
Adjusted MRL	1
Base GOR	0
BWR	1
Cumulative overproduction status	1
Daily MRL	1
Gas flared/vented	1
GOR	0
GOR penalty factor	2
GRR	1
HWM	1
Monthly oil/gas production	1
Monthly overproduction penalty	1

When rounding, add five to the last digit and then drop the last digit of the sum.

Figure 1. ***Oil and Gas Conservation Regulations*, Schedule 5, Tabulation of Basic Well Rates**

Schedule 5

Tabulation of Basic Well Rates

Effective 1 February 1984

Pool Average Well Depth – M	Basic Well Rate – m^3 per day
0-2000	8.0
2001-2100	8.5
2101-2170	9.0
2171-2230	9.5
2231-2290	10.0
2291-2340	10.5
2341-2390	11.0
2391-2440	11.5
2441-2490	12.0
2491-2530	12.5
2531-2570	13.0
2571-2610	13.5
2611-2650	14.0
2651-2690	14.5
2691-2730	15.0
2731-2760	15.5
2761-2790	16.0
2791-2820	16.5
2821-2850	17.0
2851-2880	17.5
2881-2910	18.0
2911-2940	18.5
2941-2970	19.0
2971-3000	19.5
3001 and deeper	20.0

AR 151/71 Sched. 5;140/72;229/79;264/84

Figure 2. Example of Appendix I to the MRL Order

ERCB Energy Resources Conservation Board

Appendix I to MRL Order No. 237

June 2009

1 Field / Pool Name	2 Pool Type	3 Codes			4 Basic Well Rate (m^3/day)	5 Maximum Rate Limitation (m^3/day)	6 Base GOR (m^3/m^3)	7 Special Provisions (See Appendix II)
		Field	Pool	Pool Type				
AETNA								
SECOND WHITE SPECKS A	Prim	0004	186001	00	10.0	GPP		
ALBRIGHT								
NIKANASSIN B	Prim	0040	408002	00	8.5	9.9	190	
CHARLIE LAKE B	Prim	0040	508002	00	10.0	GPP		
ALDERSON								
UPPER MANNVILLE D	Prim	0043	250004	00	8.0	GPP		
UPPER MANNVILLE D	WF	0043	250004	20	8.0	GPP		
UPPER MANNVILLE R	Prim	0043	250018	00	8.0	8.0	130	
UPPER MANNVILLE R	WF	0043	250018	20	8.0	GPP		
UPPER MANNVILLE S	WF	0043	250019	20	8.0	GPP		
UPPER MANNVILLE Y	WF	0043	250025	20	8.0	GPP		
UPPER MANNVILLE Z	WF	0043	250026	20	8.0	GPP		12a
UPPER MANNVILLE AA	WF	0043	250027	20	8.0	GPP		
UPPER MANNVILLE EE	WF	0043	250031	20	8.0	GPP		
UPPER MANNVILLE KK	Prim	0043	250037	00	8.0	GPP		
UPPER MANNVILLE XX	Prim	0043	250050	00	8.0	GPP		
UPPER MANNVILLE YY	WF	0043	250051	20	8.0	GPP		
UPPER MANNVILLE TTT	WF	0043	250720	20	8.0	GPP		
UPPER MANNVILLE VVV	WF	0043	250722	20	8.0	GPP		
UPPER MANNVILLE XXX	WF	0043	250724	20	8.0	GPP		
UPPER MANNVILLE D2D	Prim	0043	250730	00	8.0	8.0	110	12
UPPER MANNVILLE D2D	WF	0043	250730	20	8.0	GPP		12
UPPER MANNVILLE J2J	Prim	0043	250736	00	8.0	GPP		
UPPER MANNVILLE M2M	Prim	0043	250739	00	8.0	GPP		
UPPER MANNVILLE N2N	Prim	0043	250740	00	8.0	GPP		
UPPER MANNVILLE T2T	Prim	0043	250746	00	8.0	GPP		
UPPER MANNVILLE Z2Z	Prim	0043	250752	00	8.0	GPP		
UPPER MANNVILLE W3W	Prim	0043	251123	00	8.0	GPP		
UPPER MANNVILLE C4C	Prim	0043	251129	00	8.0	GPP		
UPPER MANNVILLE N4N	Prim	0043	251140	00	8.0	GPP		
UPPER MANNVILLE D5D	Prim	0043	251504	00	8.0	GPP		
UPPER MANNVILLE Q5Q	Prim	0043	251517	00	8.0	GPP		
UPPER MANNVILLE R5R	Prim	0043	251518	00	8.0	GPP		
UPPER MANNVILLE S5S	Prim	0043	251519	00	8.0	GPP		
UPPER MANNVILLE Y5Y	Prim	0043	251525	00	8.0	GPP		
UPPER MANNVILLE Z5Z	Prim	0043	251526	00	8.0	GPP		
UPPER MANNVILLE F6F	Prim	0043	251532	00	8.0	GPP		
UPPER MANNVILLE I6I	Prim	0043	251535	00	8.0	GPP		
UPPER MANNVILLE K6K	Prim	0043	251537	00	8.0	GPP		
LOWER MANNVILLE A	Prim	0043	310001	00	8.0	GPP		
LOWER MANNVILLE B	Prim	0043	310002	00	8.0	GPP		
LOWER MANNVILLE B	WF	0043	310002	20	8.0	GPP		
LOWER MANNVILLE F	Prim	0043	310006	00	8.0	GPP		
LOWER MANNVILLE H	Prim	0043	310008	00	8.0	GPP		
LOWER MANNVILLE J	Prim	0043	310010	00	8.0	GPP		
LOWER MANNVILLE O	Prim	0043	310015	00	8.0	GPP		
LOWER MANNVILLE U	Prim	0043	310021	00	8.0	GPP		
LOWER MANNVILLE W	Prim	0043	310023	00	8.0	GPP		
LOWER MANNVILLE X	Prim	0043	310024	00	8.0	GPP		
LOWER MANNVILLE Z	Prim	0043	310026	00	8.0	GPP		

Figure 3. Descriptions of each column in an MRL order

Appendix I to the MRL order

Columns	Definitions
1	Field/pool names as defined by the ERCB
2	Pool type – recovery mechanism for the pool (code): • Prim – Primary Depletion (00) • SF – Solvent Flood (10) • WF – Water Flood (20) • PF – Polymer Flood (21) • GF – Gas Flood (40) • ASP – Acid Surfactant Polymer Flood (70)
3	Field, pool, and pool type codes as defined by the ERCB
4	Basic Well Rate (BWR)—the lowest unpenalized MRL assigned to a producing oil well in a pool or pool type; related to the average well depth of the pool, as tabulated in Schedule 5 of the *OGCR* (see Figure 1).
5	Maximum Rate Limitation (MRL) for the wells in that pool or pool type; pools on GPP are not subject to an MRL, unless other directives are specified in Appendix II of the MRL order or entities that are retiring outstanding overproduction under GRR from previous MRL administration.
6	Base GOR (as calculated in accordance with Schedule 6 of the *OGCR*).
7	Special provisions applicable to pools or to individual entities in a pool type (the specific clauses are described in Appendix II of the MRL order).

Figure 4. ERCB Form O-38

ERCB Energy Resources Conservation Board

Application for a New Well Base MRL
For confidential pools and undefined areas only

Submit within 30 days of initial oil production to O38.Applications@ercb.ca.
Include any additional supporting evidence of the pool designation.

Well name _____ Unique well identifier | | | | | | W | | | (LE LSD SEC TWP RGE M ES)

Field _____ Pool _____ Formation _____

KB elevation _____ m Finished drilling date (yyyy mm dd) | | | | On production date (yyyy mm dd) | | | |

Initial production data	Date yyyy	mm	dd	Hours	Production method	Choke/ strokes	Clean oil production	GOR (m^3/m^3)	Water cut (%)	Oil density (kg/m^3)

OPERATOR'S SUBMISSION **FOR ERCB USE ONLY**

	MD	TVD	MD	TVD
G/O interface ☐ or porosity top ☐ m(KB)				
O/W interface ☐ or porosity base ☐ m(KB)				
Average well depth ..... m				
Perforated interval ..... m(KB)				
Lower cutoffs Ø / K ..... % / mD				
Area ..... ha				
Pay ..... m				
Ø ..... fraction				
1-Sw ..... fraction				
1/Boi ..... fraction				
N ..... $10^3 m^3$				
Ri ..... fraction				
RiN ..... $10^3 m^3$				
P_b ..... kPa				
Rsi ..... m^3/m^3				

P_i _____ kPa Temperature _____ °C Unique well identifier | | | | | | W | | | (LE LSD SEC TWP RGE M ES)

Date (yyyy-mm-dd) Signed

Contact name _____ BWR _____ m^3/d Base MRL _____ m^3/d HWM _____

Company _____ Base GOR _____ m^3/m^3 Oil density _____ kg/m^3

Contact phone number _____ Pool designation:

Email address _____

FOR ERCB USE ONLY Remarks:

per Energy Resources Conservation Board

Date approved (yyyy mm dd) | | | |

O-38 2012-04 Energy Resources Conservation Board 250 5 Street SW Calgary, Alberta T2P 0R4

Figure 5. Allowable record for a horizontal well

ERCB Energy Resources Conservation Board

Allowable Record

May 2009

Well Identifier	Field Code	Pool Code	Pool Type	Project	Block	Base GOR	Off-Target Penalty	Horizontal Well Modifier	Operator
00/01-01-001-01W4/0	0998	000098	00	000	000	300	0.0000	2.0	0000

Production Date	Months Over	Net GOR Penalty Relief	Confidential	Remarks
2008-12	0	N	N	EXAMPLE - well assigned a Horizontal Well Modifier

Month	Oil Production	Gas Production	Prod GOR	Gas Flared	Adjusted MRL	Monthly Over Production	Monthly Penalty	Cumulative OP Status	BWR	Daily MRL	Counter	GOR Penalty	Base GOR
2008-03													
2008-04													
2008-05													
2008-06													
2008-07													
2008-08													
2008-09													
2008-10													
2008-11													
2008-12	1222.0	212.2	174	3.4	1240.0	-18.0		-18.0	8.0	20.0	11	1.00	300
2009-01	944.4	162.6	172	6.7	1240.0	-295.6		-313.6	8.0	20.0	12	1.00	300
2009-02	999.5	175.6	176	2.9	1120.0	-120.5		-434.1	8.0	20.0	13	1.00	300
2009-03	1305.6	239.0	183	5.2	1240.0	65.6		-368.5	8.0	20.0	14	1.00	300
2009-04	475.7	90.2	190	0.0	480.0	-4.3			8.0	8.0	21	1.00	300
2009-05	495.8	88.8	179	2.2	496.0	-0.2			8.0	8.0	22	1.00	300

1

Figure 6. Allowable record with overproduction calculation

ERCB Energy Resources Conservation Board

Allowable Record

May 2009

Well Identifier	Field Code	Pool Code	Pool Type	Project	Block	Base GOR	Off-Target Penalty	Horizontal Well Modifier	Operator
00/01-01-001-01W5/0	0998	000098	00	000	000	80	0.0000	1.0	0000

Production Date	Months Over	Net GOR Penalty Relief	Confidential	Remarks
2008-08	4	N	N	EXAMPLE - Overproduced Well

Month	Oil Production	Gas Production	Prod GOR	Gas Flared	Adjusted MRL	Monthly Over Production	Monthly Penalty	Cumulative OP Status	BWR	Daily MRL	Counter	GOR Penalty	Base GOR
2008-03													
2008-04													
2008-05			-										
2008-06													
2008-07													
2008-08	352.4	6.9	20	6.9	620.0	-267.6		-267.6	8.0	20.0	11	1.00	80
2008-09					0.0	0.0		-267.6	8.0	20.0	11	1.00	80
2008-10	323.8	6.2	19	6.2	620.0	-296.2		-563.8	8.0	20.0	12	1.00	80
2008-11	342.3	6.1	18	6.1	600.0	-257.7		-821.5	8.0	20.0	13	1.00	80
2008-12	305.0	3.3	11	3.3	620.0	-315.0		-1136.5	8.0	20.0	14	1.00	80
2009-01	263.5	3.4	13	3.4	248.0	15.5		15.5	8.0	8.0	21	1.00	80
2009-02	292.8	6.7	23	6.7	224.0	68.8	23.2	107.5	8.0	8.0	22	1.00	80
2009-03	265.8	5.8	22	5.8	248.0	17.8		125.3	8.0	8.0	23	1.00	80
2009-04	285.2	6.5	23	6.5	240.0	45.2	10.6	181.1	8.0	8.0		1.00	80
2009-05	232.3	4.9	21	4.9	248.0	-15.7		165.4	8.0	8.0		1.00	80

Figure 7. Allowable record with GRR calculation under NOWPP

ERCB Energy Resources Conservation Board

Allowable Record

May 2009

Well Identifier	Field Code	Pool Code	Pool Type	Project	Block	Base GOR	Off-Target Penalty	Horizontal Well Modifier	Operator
00/01-01-001-01W6/0	0998	000098	00	000	000	0	0.0000	1.0	0000

Production Date	Months Over	Net GOR Penalty Relief	Confidential	Remarks
2009-01	0	N	N	EXAMPLE - NOWPP overproduced well subject to GRR

Month	Oil Production	Gas Production	Prod GOR	Gas Flared	Adjusted MRL	Monthly Over Production	Monthly Penalty	Cumulative OP Status	BWR	Daily MRL	Counter	GOR Penalty	Base GOR
2008-03													
2008-04													
2008-05													
2008-06													
2008-07													
2008-08													
2008-09													
2008-10													
2008-11													
2008-12													
2009-01	500.0	50.0	100	0.0	620.0	-120.0		-120.0	8.0	20.0	11	1.00	150
2009-02	800.0	78.0	98	0.0	560.0	240.0		120.0	8.0	20.0	12	1.00	150
2009-03	800.0	81.0	101	0.0	620.0	180.0		300.0	8.0	20.0	13	1.00	150
2009-04	1500.0	150.0	100	0.0	600.0	900.0		1200.0	8.0	20.0	14	1.00	150
2009-05					1550.0	-1550.0			8.0	50.0	21	1.00	0

Figure 8. Terms on an allowable record

Terms	Definitions
Horizontal well modifier (HWM)	HWM is a factor assigned to the MRL of a horizontal well. For vertical wells, the HWM is shown as 1.0.
Operator	Code of the operator of the production entity and one who is responsible for any overproduction. For allowable purposes, operator is the company reporting the production data.
Production date	The earlier of the well's on-production date as specified on the well status change on the Petroleum Registry of Alberta (PRA) or the date of first production.
Months over	Number of months the cumulative overproduction status exceeds 10% of its adjusted MRL or when overproduction is not retired after exceeding 10% of the adjusted MRL.
Net GOR penalty relief	GOR penalty relief, where the GOR penalty is based only on the flared/vented gas volumes
Confidential	Confidential status of the well.
Gas flared	Volume of gas flared or vented.
Adjusted MRL	Monthly MRL for the production entity after all applicable penalties.
Monthly overproduction	Difference between the adjusted MRL and oil production.
Monthly penalty	Penalty assessed on overproduction exceeding 10% of the monthly adjusted MRL.
Cumulative overproduction status	Sum of previous and current month's overproduction, including any penalty.
Counter	Code in the Allowable Record for ERCB use for calculation of the adjusted MRL.
GOR penalty	Penalty factor assessed against the base MRL when an entity's producing GOR exceeds the base GOR